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EPA Office of Compliance Sector Notebook Project:

Profile of the Ground Transportation Industry Trucking, Railroad, and Pipeline

September 1997

Office of Compliance
Office of Enforcement and Compliance Assurance
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Electronic versions of all Sector Notebooks are available via Internet on the Enviroene World Wide Web. Downloading procedures are described in Appendix A of this document.

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List of Acronyms

AAR - Association of American Railroads
AFS - AIRS Facility Subsystem (CAA database)
AGA - American Gas Association
AIRS - Aerometric Information Retrieval System (CAA database)
ATA - American Trucking Associations
BIFs - Boilers and Industrial Furnaces (RCRA)
BOD - Biochemical Oxygen Demand
CAA - Clean Air Act
CAAA - Clean Air Act Amendments of 1990
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS - CERCLA Information System
CFCs - Chlorofluorocarbons
CO - Carbon Monoxide
COD - Chemical Oxygen Demand
CSI - Common Sense Initiative
CWA - Clean Water Act
D&B - Dun and Bradstreet Marketing Index
ELP - Environmental Leadership Program
EPA - United States Environmental Protection Agency
EPCRA - Emergency Planning and Community Right-to-Know Act
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
FINDS - Facility Indexing System
HAPs - Hazardous Air Pollutants (CAA)
HSDB - Hazardous Substances Data Bank
IDEA - Integrated Data for Enforcement Analysis
LDR - Land Disposal Restrictions (RCRA)
LEPCs - Local Emergency Planning Committees
LERCs - Local Emergency Response Commissions
MACT - Maximum Achievable Control Technology (CAA)
MCLGs - Maximum Contaminant Level Goals
MCLs - Maximum Contaminant Levels
MEK - Methyl Ethyl Ketone
MSDSs - Material Safety Data Sheets
NAAQS - National Ambient Air Quality Standards (CAA)
NAFTA - North American Free Trade Agreement
NAICS - North American Industrial Classification System
NCDB - National Compliance Database (for TSCA, FIFRA, EPCRA)
NCP - National Oil and Hazardous Substances Pollution Contingency Plan
NEIC - National Enforcement Investigations Center
NESHAP - National Emission Standards for Hazardous Air Pollutants
NO_2 - Nitrogen Dioxide

NOV - Notice of Violation
NO_X - Nitrogen Oxide
NPDES - National Pollution Discharge Elimination System (CWA)
NPL - National Priorities List
NRC - National Response Center
NSPS - New Source Performance Standards (CAA)
OAR - Office of Air and Radiation
OECA - Office of Enforcement and Compliance Assurance
OPA - Oil Pollution Act
OPPTS - Office of Prevention, Pesticides, and Toxic Substances
OSHA - Occupational Safety and Health Administration
OSW - Office of Solid Waste
OSWER - Office of Solid Waste and Emergency Response
OW - Office of Water
P2 - Pollution Prevention
PCS - Permit Compliance System (CWA Database)
POTW - Publicly Owned Treatments Works
RCRA - Resource Conservation and Recovery Act
RCRIS - RCRA Information System
RPI - Railway Progress Institute
RSPA - Research and Special Programs Administration
SARA - Superfund Amendments and Reauthorization Act
SDWA - Safe Drinking Water Act
SEPs - Supplementary Environmental Projects
SERCs - State Emergency Response Commissions
SIC - Standard Industrial Classification
SO_2 - Sulfur Dioxide
SPCC - Spill Prevention Control and Countermeasure
TOC - Total Organic Carbon
TRI - Toxic Release Inventory
TRIS - Toxic Release Inventory System
TCRIS - Toxic Chemical Release Inventory System
TSCA - Toxic Substances Control Act
TSDF - Treatment, Storage and Disposal Facility
TSS - Total Suspended Solids
UIC - Underground Injection Control (SDWA)
UST - Underground Storage Tanks (RCRA)
VOCs - Volatile Organic Compounds

TRANSPORTATION INDUSTRY (SIC 40, 42, 46, AND 49)

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Integrated environmental policies based upon comprehensive analysis of air, water and land pollution are a logical supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, enforcement and compliance assurance, education/ outreach, research, and regulatory development issues. The central concepts driving the new policy direction are that pollutant releases to each environmental medium (air, water and land) affect each other, and that environmental strategies must actively identify and address these inter-relationships by designing policies for the "whole" facility. One way to achieve a whole facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial "sector-based" approach within the EPA Office of Compliance led to the creation of this document.

The Sector Notebook Project was originally initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for eighteen specific industrial sectors. As other EPA offices, states, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded to its current form. The ability to design comprehensive, common sense environmental protection measures for specific industries is dependent on knowledge of several inter-related topics. For the purposes of this project, the key elements chosen for inclusion are: general industry information (economic and geographic); a description of industrial processes; pollution outputs; pollution prevention opportunities; Federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue, and references where more in-depth information is available. Text within each profile was researched from a variety of sources, and was usually condensed from more

detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that can be further explored based upon the citations and references listed at the end of this profile. As a check on the information included, each notebook went through an external review process. The Office of Compliance appreciates the efforts of all those that participated in this process who enabled us to develop more complete, accurate and up-to-date summaries. Many of those who reviewed this notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this notebook.

I.B. Additional Information

Providing Comments

OECA's Office of Compliance plans to periodically review and update the notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing notebook, or if you would like to provide additional information, please send a hard copy and computer disk to the EPA Office of Compliance, Sector Notebook Project (2223-A), 401 M St., SW, Washington, DC 20460. Comments can also be uploaded to the Enviroene World Wide Web for general access to all users of the system. Follow instructions in Appendix A for accessing this system. Once you have logged in, procedures for uploading text are available from the on-line Enviroene Help System.

Adapting Notebooks to Particular Needs

The scope of the industry sector described in this notebook approximates the national occurrence of facility types within the sector. In many instances, industries within specific geographic regions or states may have unique characteristics that are not fully captured in these profiles. The Office of Compliance encourages state and local environmental agencies and other groups to supplement or re-package the information included in this notebook to include more specific industrial and regulatory information that may be available. Additionally, interested states may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section with state and local requirements. Compliance or technical assistance providers may also want to develop the "Pollution Prevention" section in more detail. Please contact the appropriate specialist listed on the opening page of this notebook if your office is interested in assisting us in the further development of the information or policies addressed within this volume. If you are interested in assisting in the development of new notebooks for sectors not already covered, please contact the Office of Compliance at 202-564-2395.

II. INTRODUCTION TO THE GROUND TRANSPORTATION INDUSTRY

This section provides background information on the size, geographic distribution, employment, production, sales, and economic condition of the ground transportation industry. Facilities described within this document are described in terms of their Standard Industrial Classification (SIC) codes.

II.A. Introduction, Background, and Scope of the Notebook

This notebook pertains to the transportation industry as classified by the Office of Management and Budget (OMB) under Standard Industrial Classification (SIC) codes 40 (Rail Transportation); 42 (Trucking); and 46, 4922-4924 (Pipelines). Where possible, data are specific to sub-divisions of these SIC codes. In many cases, information about the industries (i.e., rail, trucking, and pipeline) does not directly correlate to SIC distinctions. This is due to various factors, including different reporting requirements and classifications within each industry that are not consistent with SIC delineations. This limitation is discussed throughout the notebook, as appropriate. OMB is in the process of changing the SIC code system to a system based on similar production processes called the North American Industrial Classification System (NAICS). In the NAICS system, Rail Transportation is classified as NAIC 482, Trucking is NAIC 484 and 492, and Pipelines are NAIC 486.

The transportation industry includes other modes of transport such as water and air. Although these are not addressed in this document, they make up an important portion of overall transportation activity in the United States.

The transportation industry affects nearly every American. Either through the necessity of traveling from one place to another, shipping goods and services around the country, or working in a transportation-related job, transportation's share of the national economy is significant. According to the Eno Transportation Foundation, for all transportation-related industries, total transportation expenditures in the U.S. accounted for 16.1 percent of the gross national product in 1993.

II.B. Industry Sectors Analyzed

II.B.1. Rail Transportation

The rail transportation industry includes establishments furnishing transportation by line-haul railroad, and switching and terminal establishments. These terms refer to the distance the particular railroad operation covers — line-haul operations cover longer distances, often connecting two cities, while switching and terminal railroads generally travel

through a single city. For the purpose of this notebook, rail transportation does not include passenger railways serving a single municipality, contiguous municipalities, or a municipality and its suburban areas; these economic units are classified in SIC 41. Other services related to railroad transportation are classified in SIC 47; lessors of railroad property are classified in SIC 6517. The rail SIC sectors covered in this notebook are shown in the following table.

SIC 40 - RAILROAD TRANSPORTATION	
4011	Railroads, Line-Haul Operations
4013	Railroad Switching and Terminal Establishments

II.B.2. Trucking

The trucking industry includes establishments engaged in motor freight transportation and warehousing. This includes local and long-distance trucking or transfer services, and establishments engaged in the storage of farm products, furniture, and other household goods, or commercial goods of any kind. For the purpose of this notebook, the trucking industry also includes the operation of terminal facilities for handling freight, both those with and without maintenance facilities. The trucking SIC sectors covered in this notebook are shown in the following table.

SIC 42 - MOTOR FREIGHT TRANSPORTATION & WAREHOUSING	
4212	Local Trucking Without Storage
4213	Trucking, Except Local
4214	Local Trucking With Storage
4215	Courier Services, Except by Air
4221	Farm Product Warehousing & Storage
4222	Refrigerated Warehousing & Storage
4225	General Warehousing & Storage
4226	Special Warehousing & Storage, NEC*
4231	Terminal & Joint Terminal Maintenance Facilities for Motor Freight Transportation

* NEC = Not Elsewhere Classified

II.B.3. Pipelines

The pipeline industry includes establishments primarily engaged in the pipeline transportation of petroleum and other commodities. Pipelines are classified within two SIC categories, Major Group 46 (Pipelines, except Natural Gas) and Major Group 49 (Electric, Gas, and Sanitary Services). This notebook will integrate the relevant operations from the two groups whenever possible. Occasionally, due to surveys that focus only on one of the groupings, data is segregated. The pipeline SIC sectors covered in this notebook are shown in the following table.

SIC 46 - PIPELINES, EXCEPT NATURAL GAS	
4612	Crude Petroleum Pipelines
4613	Refined Petroleum Pipelines
4619	Pipelines, NEC*
SIC 49 - ELECTRIC, GAS, AND SANITARY SERVICES	
4922	Natural Gas Transmission
4923	Natural Gas Transmission and Distribution
4924	Natural Gas Distribution
4925	Mixed, Manufactured, or Liquefied Petroleum Gas Production and/or Distribution

* NEC = Not Elsewhere Classified

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III. RAIL TRANSPORTATION

III.A. Characterization of the Rail Transportation Industry

III.A.1.Industry Characterization

On February 28, 1827, the State of Maryland chartered the Baltimore & Ohio (B&O) Railroad, inaugurating America's first common-carrier railroad. The B&O marked the beginning of the nation's rail system. By 1850, rail trackage extended over 9,000 miles, mostly in the Northeast. Mirroring the movement of people to the American West, the first transcontinental rail link opened in 1869. By 1916, railroad tracks stretched across 254,000 miles. During the mid-twentieth century, railroads suffered from strict regulation and increased competition from trucks, buses, barges, and planes. By the late 1970s, nearly a quarter of the nation's rail mileage was operated in bankruptcy.

Railroads began to recover economically in 1980 with the passage of the Staggers Rail Act. This legislation partially deregulated the shipment rates charged by railroads, but continued to allow the Interstate Commerce Commission (ICC) to protect shippers from market abuse. The economic balance struck by the Staggers Act renewed the rail industry: by 1990, the rates charged to ship goods by rail had fallen 28.8 percent (adjusted for inflation). Ton-miles of freight moved by rail (reflecting the number of tons hauled and the miles traveled) per employee more than doubled from 1980 levels.

By 1993, the biggest railroads moved a record 1.1 trillion ton-miles of freight with 57 percent fewer employees, 30 percent fewer miles of track, 36 percent fewer locomotives, and 48 percent fewer freight cars than in 1980 (*Association of American Railroads Information Handbook*, 1994).

From an environmental standpoint, it is important to recognize that other industries have grown up around the rail industry. For example, railroads do not generally clean rail tank cars. This is usually performed by service companies on a fee-for-service basis. In addition, rail cars and tank cars are often owned and loaded by the shipper at its facility. Some of the operations described in this section are performed by these types of entities.

III.A.2. Industry Size and Geographic Distribution

Industry Size

Variations in facility counts occur across data sources due to many factors, including reporting and definition differences. This document does not attempt to reconcile these differences, but rather reports the data as they are maintained by each source.

The Interstate Commerce Commission (ICC) was the Federal agency that regulated many economic aspects of the rail industry. The ICC was abolished by an act of Congress in December 1995, with remaining essential functions transferred to a newly created Surface Transportation Board (STB) within the Department of Transportation. ICC statistics reported prior to the ICC's abolishment are referenced in this document. The ICC classified railroads based on their level of operating revenue. The levels are adjusted annually to reflect inflation. For 1994, the revenue threshold for Class I railroads was $255.9 million or more; Class II railroads had revenues of between $20.5 million and $255.8 million; and Class III railroads had revenues of less than $20.5 million. Since 1979, the ICC required reporting on financial and operating information from Class I railroads only. Class I railroad systems make up approximately two percent of the number of American railroads, but account for 73 percent of the mileage operated, 89 percent of the employees, and 90 percent of freight revenue in the industry. To fill the gap in information left by the ICC's decreased reporting requirements, the Association of American Railroads (AAR) annually surveys non-Class I railroads.

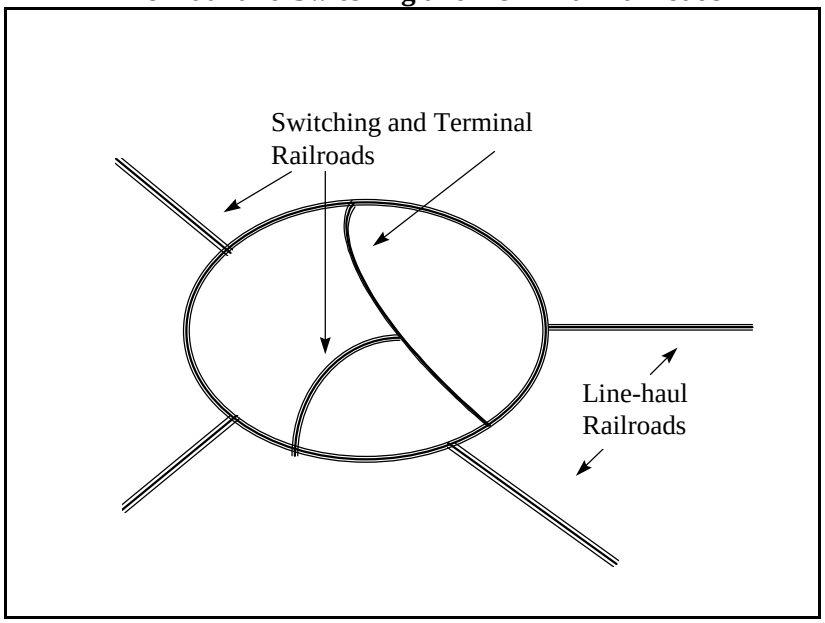
The AAR defines non-Class I railroads as being either regional or local (in contrast to the ICC definitions, which were based strictly on revenue). In 1994, regional railroads were defined as line-haul railroads operating at least 350 miles of road and/or earning revenue between $40 million and $255.9 million. Local railroads included those line-haul operations not meeting the regional criteria, plus switching and terminal railroads. Exhibit 1 summarizes the operating information for Class I, regional, and local railroads. Exhibit 2 depicts the relationship between line-haul railroads and switching and terminal railroads.

Exhibit 1
Facility Size Distribution of Rail Industry

Railroad	Number	Miles Operated	Year-End Employees	Freight Revenue
Class I	**12**	**123335**	**189,240**	**$29,930,893**
Regional	**32**	**19842**	**10,701**	**$1,744,893**
Local	**487**	**25599**	**13,070**	**$1,422,285**
Total	**531**	**168776**	**213,011**	**$33,098,071**

Source: Compiled from Railroad Facts (Association of American Railroads, 1995).

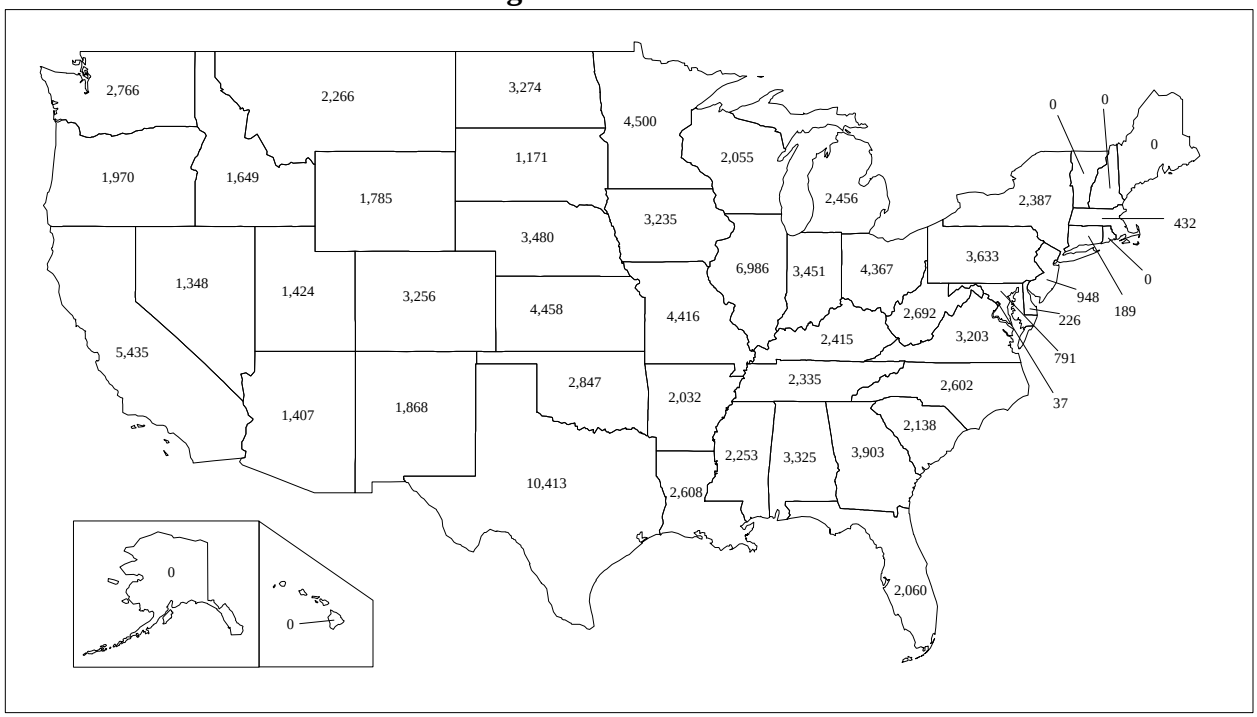
Exhibit 2
Line-Haul and Switching and Terminal Railroads



Geographic Distribution

Reflecting the national importance of railroad transportation, the rail industry is widely dispersed, and the rail system passes through every State in the country. Due to the nature of its operations, however, the rail industry is not characterized on a State-by-State basis, but rather by dividing the country into two halves, separated by the Mississippi River. Freight train-miles measure the movement of a train the distance of one mile, and are based on the distance between terminals and/or stations. Of the 440,896,000 total freight-train miles in the U.S. in 1994, 281,347,000 (64 percent) are West of the Mississippi and 159,549,000 (36 percent) are East of the Mississippi. Exhibit 3 illustrates the miles of track associated with major rail routes in the United States.

Exhibit 3
Geographic Distribution of Railroads in the United States:
Mileage of Class I Railroads*



III.A.3. Economic Trends

The rail industry began to recover from a period of nearly 25 years of steady economic decline in 1980, with the passage of the Staggers Act. This legislation allowed railroad managers to restructure internal operations and meet competitive pressures. The Staggers Act authorized railroads to offer contract rate volume discounts for guaranteed shipments. The railroad is assured minimum volumes, which assists in capital budgeting and operations planning.

The railroad industry rebounded from the effects of widespread flooding in 1993 to post improved financial and operational results in 1994. Class I railroad traffic in 1994 increased 8.2 percent from 1993 to 1.201 trillion revenue ton-miles, reflecting increases in tons originated and longer average hauls. American railroads accounted for 39.2 percent of total inter-city revenue freight ton-miles.

Operating revenue rose 6.9 percent in 1994 to $30.8 billion, while operating expenses rose at a less rapid rate of 4.1 percent to $25.5 billion. Net railway operating income (defined as operating revenue minus the sum of operating expenses, current and deferred taxes, and rents for equipment and joint facilities) was $3.4 billion, an increase of 34.7 percent over 1993 figures.

Traditionally, the largest segment of railroad freight has been coal. In 1994, coal accounted for 39.1 percent of total tonnage and 21.7 percent of freight revenue. Other major rail commodities in 1994 included chemicals and allied products, motor vehicles and equipment, food and kindred products, and farm products. Exhibit 4 summarizes the tons originated and revenue associated with the shipment of commodities by Class I railroads in 1994.

Exhibit 4
Tons Originated and Revenue by Commodity — 1994*

	TONS ORIGINATED		REVENUE	
Commodity Group	Tons (thousands)	Percent of Total	$(millions)	Percent of Total
Coal	574,213	39.1	7,021	21.7
Chemicals & Allied Products	142,931	9.7	4,559	14.1
Farm Products	130,992	8.9	2,407	7.4
Non-metallic Minerals	106,404	7.2	862	2.7
Food & Kindred Products	87,710	6	2,427	7.5
Lumber & Wood Products	54,192	3.7	1,421	4.4
Primary Metal Products	47,799	3.3	1,165	3.6
Stone, Clay & Glass Products	42,257	2.9	1,009	3.1
Petroleum & Coke	41,564	2.8	928	2.9
Metallic Ores	40,367	2.7	378	1.2
Pulp, Paper & Allied Products	36,583	2.5	1,510	4.7
Waste & Scrap Materials	36,527	2.5	655	2
Motor Vehicles & Equipment	27,792	1.9	3,174	9.8
All Other Commodities	100,666	6.8	4,909	15.1
TOTAL	1,469,997	100	32,424	100

**Information is for Class I railroads only.*
Source: Railroad Facts (Association of American Railroads, 1995).

The 1990's saw an increase in the efficiency of railroads, the transport of different materials such as waste and scrap materials, and a shift from boxcar to the faster intermodal container transport. Intermodal is a term used to describe containerization of freight for easy transloading to different modes of transportation. For example, the same container may be transferred from a truck to a train, with both modes of transportation equipped with locks or other mechanisms to hold the container in place. In rail transport, there is a growing use of truck containers and trailers.

III.B. Operations in the Rail Transportation Industry

This section provides an overview of commonly employed operations in the railroad industry. This discussion is not exhaustive; the operations discussed are intended to represent the major sources of environmental hazards from railroad transportation practices. These operations are grouped into three categories: rail car refurbishing and maintenance; locomotive maintenance; and transportation operations. Rail car refurbishing and maintenance operations consist of cleaning the interiors and exteriors of the rail cars, striping and painting the rail cars, and maintaining/repairing rail car parts. Locomotive maintenance operations include the cleaning, repair, and maintenance of the engine and locomotive car. Transportation operations include all activities associated with the movement of locomotives and cars over a section of track, including the loading and unloading of freight.

III.B.1. Rail Car Refurbishing and Maintenance

Rail car refurbishing and maintenance consists of cleaning the interiors and exteriors of rail cars, refurbishing operations (i.e., striping and painting rail cars), and other maintenance operations (i.e., brake and wheel set repair).

The initial cleaning of rail cars involves two steps: a mechanical cleaning and a water wash. Mechanical cleaning is the physical shaking and vibrating of the rail cars to loosen dirt and other debris. Typically, dirt and debris fall through a steel grate in the floor of the maintenance facility and are intermittently collected for disposal. The wash step usually consists of a high pressure water cleaning, collection of wastewater, and wastewater treatment at an on-site treatment facility.

Refurbishing operations are not employed at all rail facilities. Many railroad establishments contract out refurbishing work. Refurbishing operations usually start with paint removal using a steel grit blast system or other method. Paint chips and grit are collected through a steel grate in the floor and the mixture is conveyed to a cyclone and filter system for separation of reusable grit and paint. Once the original paint has been removed from the rail cars, new paint is applied to the clean rail car surface.

Rail cars have brakes and wheel sets that must be maintained and sometimes repaired or replaced. Brake and wheel set maintenance and repair operations consist of disassembly, cleaning, and repair; or disassembly and replacement of damaged parts. When wheel sets and air brakes are to be replaced or rebuilt, the cars must first be disassembled. Axles that can be reused are washed in a caustic solution to remove grease and dirt. External debris is removed from the air brakes or wheels using a grit or bead blast system or other method. Parts cleaning may also include the removal of paint and

cleaning with solvents or caustics. Repaired brakes or wheel set may require repainting with spray guns.

III.B.2. Locomotive Maintenance

Locomotive maintenance includes, but is not limited to, the following operations: brake repair; large scale equipment cleaning operations (e.g., locomotive car); small scale cleaning operations (e.g., engine parts); hydraulic system repair, locomotive coolant disposal, metal machining, oil filter replacement and used oil management, painting and metal finishing, paint stripping, and spent battery management.

Locomotive maintenance operations usually take place at facility that is owned and maintained by the railroad. Most used oil is recycled or reused in energy recovery. Most locomotive batteries are recycled.

III.B.3. Transportation

Transportation operations include all activities associated with the movement of locomotives and cars over a section of track. These activities include fueling and hazardous material transport.

III.C. Raw Material Inputs and Pollution Outputs

III.C.1. Rail Car Refurbishing and Maintenance

Pollutant outputs from rail car refurbishing and maintenance are generally in the form of wastewater from preliminary cleaning of interiors and exteriors, and hazardous wastes generated from painting, paint removal, and the cleaning of parts. Exhibit 5 shows typical hazardous wastes generated including: spent solvents and solvent sludges; spent caustics and caustic sludges; paint chips; and paint sludges. Volatile organic compound (VOC) air emissions are also generated during the use of solvents and paints. Wastewater from preliminary cleaning of the rail cars and spent caustic solution is often treated in an on-site wastewater treatment system and then discharged to a publicly owned treatment works (POTW). Hazardous wastes are typically drummed and shipped off site as RCRA hazardous waste. Spent solvents, however, can be sent off site for reclamation. Brake and wheel set repair is not a significant environmental hazard, but discarded brake shoes may be regulated under the Resource Conservation and Recovery Act (RCRA) in some States.

Exhibit 5
Rail Car Refurbishing and Maintenance Process Material Input/Pollutant Output

Process	Material Input	Waste
Oil and Grease Removal	Degreasers, engine cleaners, aerosol, solvents, acids/alkalies	Ignitable wastes, spent solvents, combustible solids, waste acid/alkaline solutions, used oil
Car and Equipment Cleaning	Degreasers, solvents, acids/alkalies, cleaning fluids	Ignitable wastes, spent solvents, combustible solids, waste acid/alkaline solutions, rags
Rust Removal	Strong acids, strong alkalies	Waste acids, waste alkalies
Paint Preparation	Paint thinners, enamel reducers, white spirits	Spent solvents, ignitable wastes, ignitable paint wastes, paint wastes with heavy metals, rags
Painting	Enamels, lacquers, epoxies, alkyds, acrylics, primers	Ignitable paint wastes, spent solvents, paint wastes with heavy metals, ignitable wastes, rags
Spray Booth, Spray Guns, and Brush Cleaning	Paint thinners, enamel reducers, solvents, white spirits	Ignitable paint wastes, heavy metal paint wastes, spent solvents
Paint Removal	Solvents, paint thinners, enamel reducers, white spirits	Ignitable paint wastes, heavy metal paint wastes, spent solvents, rags

Source: U.S. EPA Office of Solid Waste, 1993.

III.C.2. Locomotive Maintenance

Each of the locomotive maintenance operations listed above is a potential source of pollution outputs. Following are brief discussions of the wastes that can be generated by these locomotive maintenance operations.

Brake Repair

Brake repair does not pose a significant environmental hazard, but discarded brake shoes may be regulated under RCRA in some States. Some older brake shoes contain asbestos and may require special disposal.

Cleaning Operations

Sludges created as a result of cleaning operations may be characterized as hazardous. If so, hazardous waste regulations must be complied with prior to disposal. Waste waters from locomotive cleaning can contain elevated levels of oil, grease, suspended solids (a measure of particulate matter in water) and pH (acidity or alkalinity of water). These substances are regulated water pollutants, so wash waters must be processed in a way that is consistent with Clean Water Act (CWA) requirements. In most cases, the State has authority for enforcement of CWA provisions and permit administration. Treatment of wash waters may be required before release to a local sewer system or an outfall regulated by a National Pollutant Discharge Elimination

System (NPDES) permit. The type of cleaning solution used may also pose an environmental concern. If mineral sprits or other chemicals are used to clean equipment, a variety of environmental compliance issues may result. Mineral sprits are hazardous substances that have environmental compliance requirements for storage, handling, and disposal.

Hydraulic System Repair

Used hydraulic fluids are listed as used oils under RCRA. The major compliance issues associated with hydraulic system repair involve handling and disposing of the hydraulic fluid, spill containment, and storage. Environmental damage can occur from waste oil seepage into the soil, waste oil run-off into water bodies during storms, and other contamination methods.

Coolant Disposal

Locomotive cooling systems do not contain automotive type ethylene glycol-based antifreeze. Because of this, locomotive cooling systems may need to be drained when engines are shut down during road operation in cold weather. Failure to do so can result in serious engine damage due to freezing of the coolant. To protect the cooling system from corrosion, locomotive coolants contain a dilute additive package, which is basically a mixture of sodium borate and sodium nitrate. The additive package usually contains a dye, to help identify leaks and ensure the cooling system is protected. The compounds are diluted in the cooling system to approximately one to three percent. The concentrations of the individual corrosion inhibitors is a fraction of one percent. Used coolant must be disposed of properly.

Metal Machining

Metal machining and punching can generate regulated wastes that may contaminate the environment from direct release into water or from stormwater runoff. Pollutant-carrying stormwater runoff may violate the CWA. Coolants from metal multi-punch operations may be regulated substances under RCRA or local waste regulations and may require special handling.

Oil Filter Replacement and Used Oil Disposal

A variety of environmental issues need to be considered when performing any oil handling activities such as oil changes or oil filter replacement to locomotives. Oil can drip or spill during maintenance and repair operations, particularly during oil filter replacement operations. Oil releases to the environment from oil drippage can also occur during locomotive tie-up. Oil filter and used oil replacement are generally conducted indoors at locomotive maintenance facilities and locomotive idling is conducted, to the extent

practical, over track pans, absorbent materials, or other collection devices. This makes it possible for most facilities to collect used oil and oil filters before they leak or spill oil into the environment. Some facilities have routed track pan drains to oil-water separation systems. Used oils are not typically categorized as hazardous wastes under RCRA, but used oils have strict disposal requirements in some States.

Painting

Painting operations can be significant sources of environmental harm. Air pollution from the evaporation of chemicals contained in the paint (e.g., solvents) can contribute to smog and worker health and safety problems. Solid and hazardous wastes from the painting process (e.g., paint-covered cloths) may contaminate water and soil if not disposed of properly. Whether hazardous wastes are generated during painting depends upon the type of paint applied. Typically, latex paints and related paint wastes are classified as non-hazardous. Ignitable or solvent-based paint or paint thinner wastes are classified as hazardous. Air pollution issues are typical concerns only for large-scale painting operations involving paint booths and associated air ducting.

Battery Storage and Disposal

Used battery storage and disposal can be a significant environmental liability for railroads since many spent signal batteries are classified as hazardous wastes under RCRA. Most locomotive batteries are lead acid and recycled as non-hazardous solid waste.

III.C.3. Transportation Operations

The three main transportation operations that pose potential environmental problems are fueling, hazardous material transport, and oil and coolant releases during transport.

Fueling Operations

Air pollution and fuel spillage are the major environmental concerns associated with fueling operations. While air emissions are a problem for volatile petroleum products such as gasoline, the railroad industry uses very little gasoline on site. Their largest fuel product is diesel fuel, which is less volatile. If gasoline is dispensed on site, it could contribute to local air quality problems, and may require permitting and control. Spilled fuel may contaminate soil, ground water, or water bodies. Some super tanker fueling systems deliver fuel at approximately four gallons per second, so even a small connection malfunction can result in a large spill event. Filling and maintenance of fuel storage may require air quality permitting in some States.

Hazardous Materials

The spilling/leaking of hazardous materials is a significant environmental concern for the rail industry. According to DOT statistics, approximately 16 percent of all hazardous material releases to the environment in 1988 were from rail transport. In addition to being harmful to the environment, hazardous material spills and releases are subject to a variety of environmental regulations and may result in costly cleanups or fines.

Valve leakage or safety valve releases can be sources of material spills on pressurized and general service tank cars or other hazardous material containers such as covered hoppers, intermodal trailers/containers, or portable tanks. These leaks can manifest themselves as odors or vapors clouds from tanker top valves; spraying or splashing from the tanker top valves; wetness on the side of the car; or drippage from the bottom outlet valve. In intermodal cars, spills/leaks can result from improper packing and resultant load shifting during transport. Intermodal container doors and other openings can be spill/release sources. Unloading and transfer facilities are high potential spill and release areas. It should be noted that it is the responsibility of the shipper to properly secure the transportation vehicles to prevent these types of occurrences. In the latest effort to identify the source of these leaks, in 1995 the Association of American Railroads (AAR) introduced the non-accident release (NAR) program. The purpose was to identify and report these releases so that corrective measures could be taken to reduce them.

If hazardous materials are transported, DOT requirements regulate car inspections, car placement, switching, and shipping papers (e.g., waybills, manifests). If hazardous materials pass through a facility, rail containers should be inspected for proper labeling, valve cover placement, any signs of leakage, proper car stenciling, and fulfillment of other DOT requirements. Placarding and/or labeling is required for all containers carrying hazardous materials.

Oil and Coolant Releases

Oil and coolant releases from the locomotive engine to the environment can occur during transport operations. Oils can contaminate surface water, ground water, and soil, and expose the rail facility to punitive fines from violations of a variety of environmental statutes. Coolants may be regulated substances under RCRA or local waste regulations.

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IV. TRUCKING

IV.A. Characterization of the Trucking Industry

IV.A.1. Industry Characterization

Construction of the nation's first transcontinental highway, the Lincoln Highway (U.S. 30), started in 1912. It took 20 years to complete the 3385-mile road between New York City and San Francisco. In 1956, the Federal Aid Highway Act was signed into law, authorizing the 41,000-mile National System of interstate and defense highways to be completed by 1972 at a cost of $42 billion. In 1982, landmark legislation boosted Federal spending for highway construction and repair work. By 1986, more than 97 percent of the 42,500-mile interstate highway system was open to traffic as the program entered its 30th year. The system represented a total Federal and State investment of more than $120 billion. Currently, there are 44,700 miles of interstate highways with 132,000 miles of other arteries in the United States.

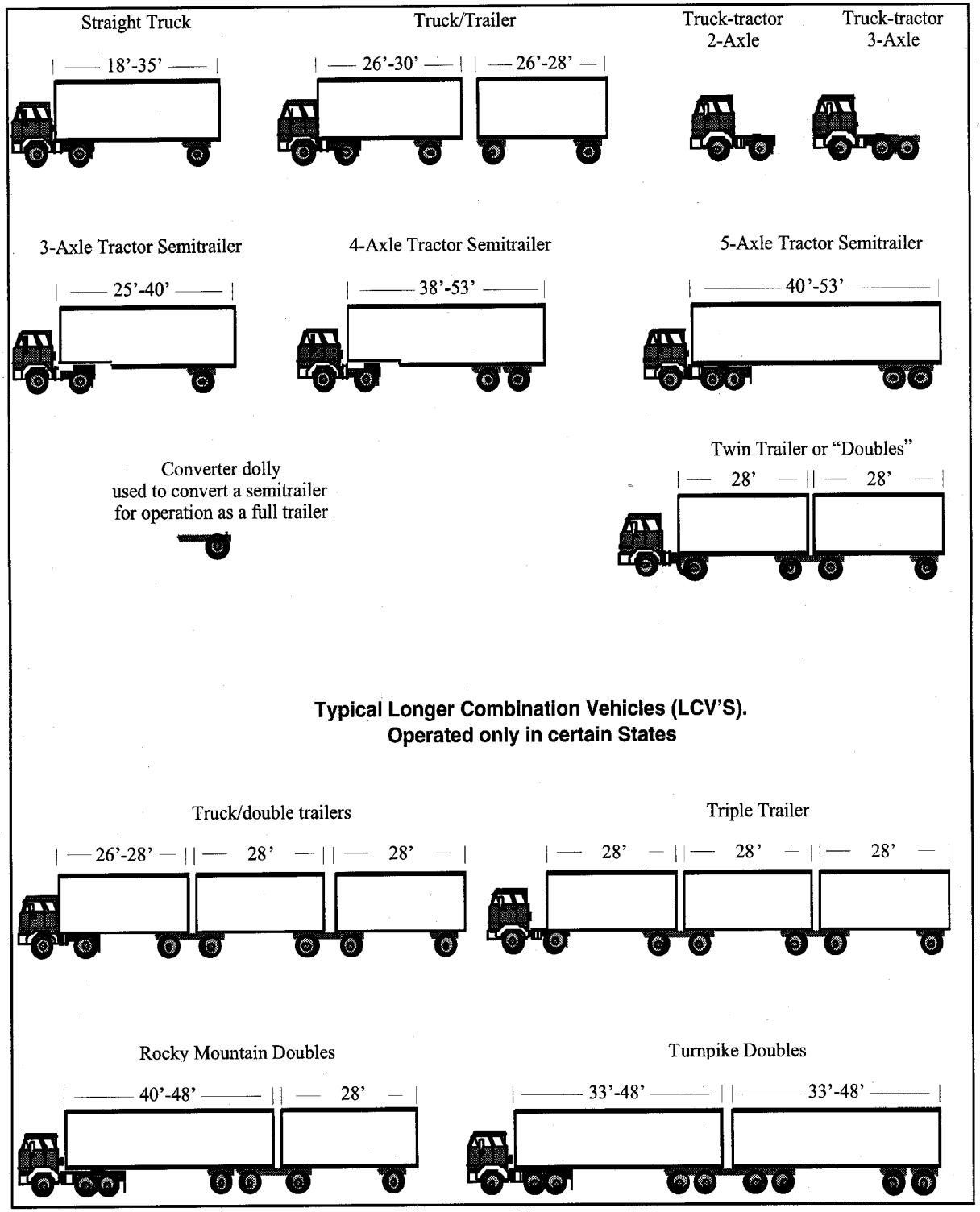
The types of trucks that travel these roads are diverse, ranging from small pickup trucks to large tractor trailer combination units. Methods of quantifying these vehicles vary as well. This section presents information from a variety of sources, including the Census Bureau and trucking associations. Different groups use various benchmarks to quantify the trucking industry. This document does not attempt to reconcile these differences, but rather reports the data as they are maintained by each source.

According to the American Trucking Associations (ATA), the total number of commercial trucks in 1993 was 16.2 million, with approximately 3.9 million commercial trailers registered in the same period. The ATA reports 322,739 interstate motor carriers on file with the U.S. Department of Transportation (DOT) as of January 5, 1995. Eighty-two percent of those operate fewer than six trucks, and 96 percent operate 28 or fewer trucks. 59,310 for-hire carriers were authorized by the Interstate Commerce Commission (ICC), to haul goods.

Types of trucks and trucking establishments are defined by various classifications. Exhibit 6 shows the shape and size of different truck types. This diagram does not include smaller trucks such as pickups, panels, vans, and utility trucks which are usually not counted in industry statistics because they are often used for personnel purposes.

In general, trucking establishments falls into two broad categories: private and for-hire. Private carriers are shippers, manufacturers, merchants, and others who use their own vehicles or leased trucks under their direct control for moving their own goods. For-hire carriers are compensated for providing transportation of freight belonging to another entity.

Exhibit 6
Truck Types



There are three types of interstate for -hire carriers: common, contract, and exempt carriers. Common carriers transport freight for the general public at published rates. Contract carriers are those in stipulated types of operations, such as trucks used only to carry newspapers, or vehicles used incidentally to support air transport. (*Motor Trucking Engineering Handbook*, James W. Fitch, Society of Automotive Engineers, 1994).

For-hire carriers regulated by the ICC were classified by size of operating revenue. The ICC was abolished by an act of Congress in December 1995, with remaining essential functions transferred to a newly created Surface Transportation Board (STB) within the Department of Transportation. ICC statistics reported prior to the ICC's abolishment are referenced in this document. As of January 1, 1994, the ICC defined Class I carriers as those establishments with annual revenues greater than $10 million, Class II carriers with annual revenues between $3 and $10 million, and Class III carriers with annual revenues of less than $3 million.

IV.A.2. Industry Size and Geographic Distribution

As discussed in Section IV.A.1 above, variation in facility counts occur across data sources due to many factors, including reporting and definition differences. This document does not attempt to reconcile these differences.

Industry Size

Trucking companies are diverse, ranging from large employers to private transporters who work for themselves and have no additional employees. A concise discussion of the trucking industry is complicated by the different methods used by the Census Bureau, the ICC, and trucking associations to estimate the size of the trucking industry. In some cases, as with most census data, only those companies with payrolls – those that pay drivers who were not also owners – are tracked. In addition, only those trucking companies formerly regulated by the ICC were required to report data.

The trucking industry consists of approximately 111,000 establishments with payrolls, employing nearly 1.6 million people. This does not include small, independent truckers who have no employees other than themselves. The total number of truck drivers holding commercial drivers licenses as of June 1995 exceeded 6.5 million. In 1993, these drivers drove 656.6 billion miles (American Trucking Trends, 1995). According to the American Trucking Associations (ATA), 7.8 million people were employed throughout the economy in jobs that relate to trucking activity and 2.8 million heavy-duty truck drivers (including linehaul, local, courier, government, etc.) were employed in 1994. In 1993, $226.9 billion was paid in wages relating to trucking activity.

Over 88 percent of trucking companies are small businesses, as defined by the Small Business Administration. According to the ATA, of the 359,787 interstate motor carriers on file with the Office of Motor Carriers, 82 percent operate six or few trucks, while 96 percent operate 28 or fewer trucks (as of February 1996).

Exhibit 7 illustrates the facility size distribution for those motor freight transportation and warehousing facilities with payrolls, based on the latest complete Census Bureau data (1992).

Exhibit 7
Facility Size Distribution of Trucking Industry*

Industry	SIC Code	Total Employees	Total Number of Facilities	Employees per Facility
Local Trucking Without Storage	4212	354,742	49,870	7.11
Trucking, Except Local	4213	758,435	40,821	18.6
Local Trucking with Storage	4214	64,417	4,512	14.3
Courier Services, Except by Air	4215	307,061	5,966	51.5
Farm Product Warehousing and Storage	4221	6,497	584	11.1
Refrigerated Warehousing and Storage	4222	18,963	929	20.4
General Warehousing and Storage	4225	49,091	6,753	7.3
Special Warehousing and Storage, NEC*	4226	20,594	1,452	14.2
Terminal and Joint Terminal Maintenance Facilities for Motor Freight Transportation	4231	295	21	14.1
Total		1,580,095	110,908	14.2

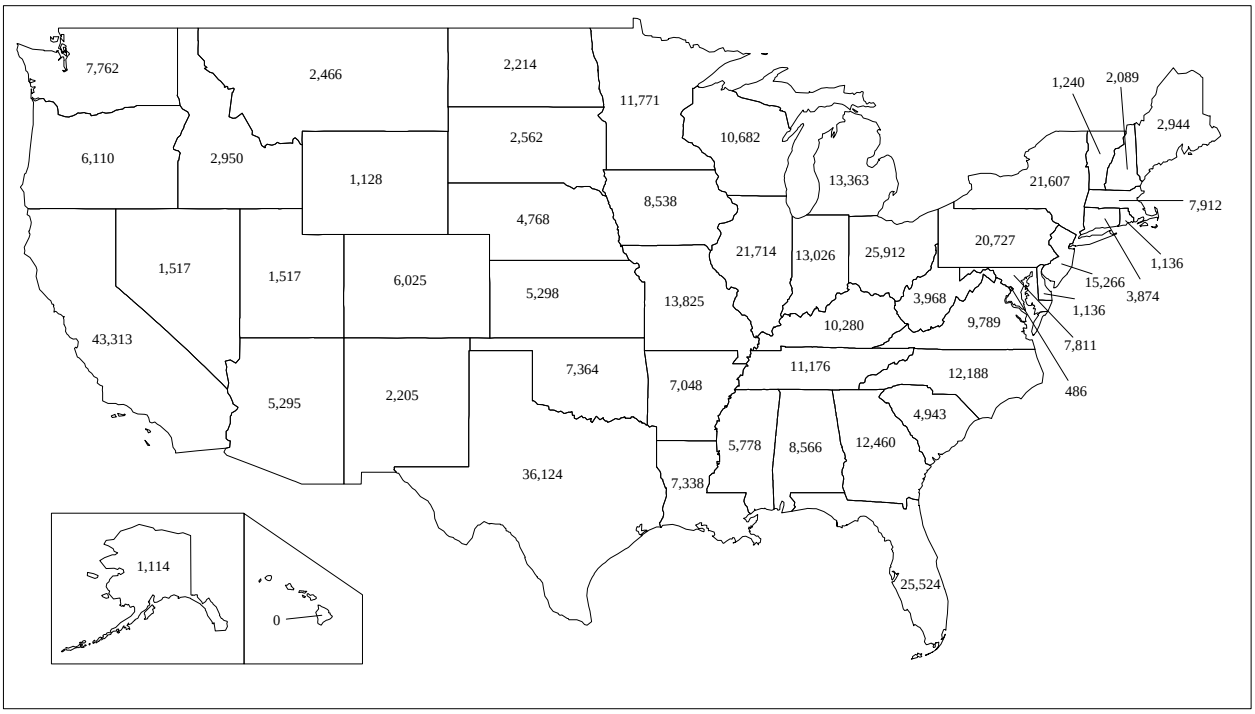
Source: Compiled from official 1992 statistics of the U.S. Bureau of the Census.
**Facilities with payrolls only.*

As demonstrated in Exhibit 7, the majority of establishments and employees in the trucking industry which maintain payrolls are classified in SIC Code 4212, Local Trucking Without Storage. This category includes dump trucking, general freight, and garbage and trash collection. Trucking, except local (SIC 4313), accounts for most of the other establishments and persons employed in the trucking industry. General freight trucking accounts for most trucking industry facilities.

Geographic Distribution

Reflecting the national importance of highway transit, the trucking industry is widely dispersed, with every State reporting the existence of at least 400 industry establishments (U.S. Bureau of the Census). The numbers in Exhibit 8 include both businesses with and without payrolls. All businesses covered by the economic censuses are included, except direct sales retail and tax exempt service businesses.

Exhibit 8
Geographic Distribution of Trucking Industry Facilities

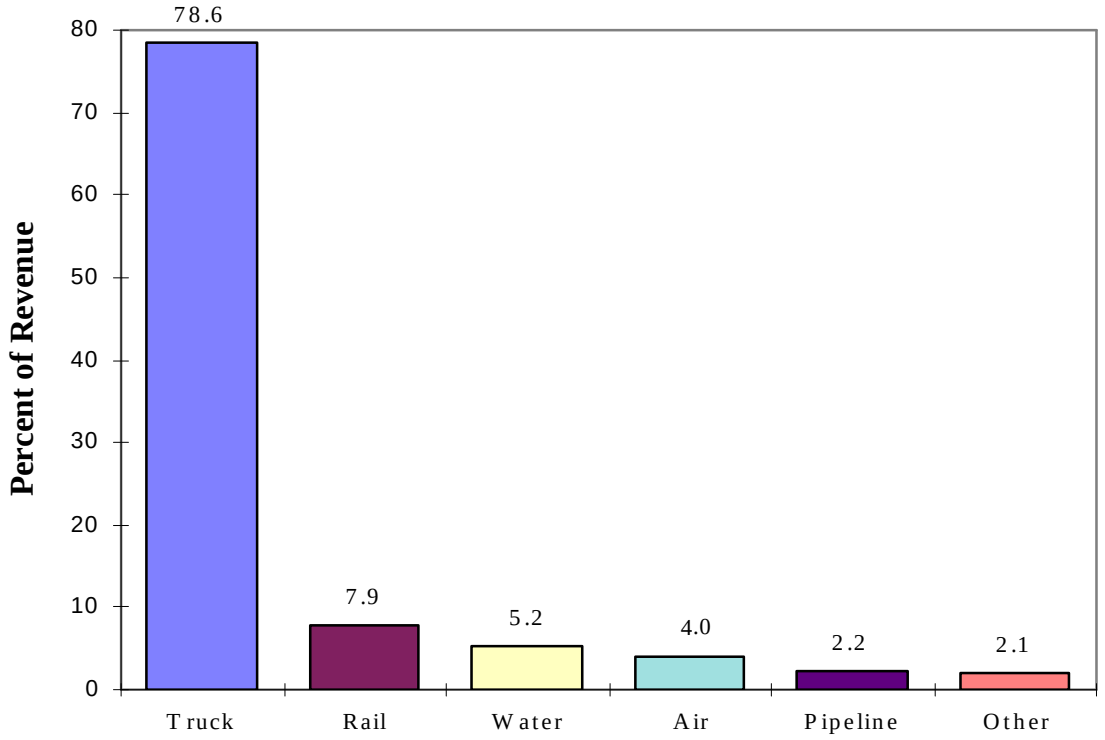


Source: Compiled from official 1992 statistics of the U.S. Bureau of the Census.

Although the trucking industry is highly represented throughout the country, motor freight facilities are most heavily concentrated around the Great Lakes States (Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio). Reflecting the important trade routes between these States and the Northeast, this concentrated area extends through Pennsylvania and New York. The five largest States in terms of number of trucking establishments with payrolls are California, Texas, Ohio, Florida, and New York.

Exhibit 8 illustrates the number of trucking establishments as recorded by the Bureau of the Census. These numbers do not correlate to those presented in Exhibit 9, also from the Bureau of the Census, due to the different scope of the census data.

Exhibit 9
Share of Freight Revenues by Mode of Transportation



Source: American Trucking Trends, 1995

IV.A.3. Economic Trends

In terms of revenue, trucking accounts for the vast majority of total U.S. freight services. Exhibit 8 illustrates the trucking industry's enormous share of total freight revenue. This reflects trucking's higher revenues-per-ton and per-ton mile (a ton-mile equals the movement of one ton of weight over a one mile distance), compared to the rail and barge sectors, which generally carry lower-valued bulk commodities. Thus, the trucking industry's share of tons shipped (43 percent) and ton-miles (27 percent) is much lower than its share of revenues (U.S. Industrial Outlook 1994 – Transportation).

The growing use of rail transport and rail transport of truck containers and trailers has offered economic competition to motor freight companies. According to the ATA, by the year 2003, trucking will lose 1.9 percent of its share of total 1993 revenue – primarily to air and rail intermodal – but trucks will still account for 76.7 percent of freight transportation revenue.

Reportedly, the estimated profit margin of the companies and independent truckers averages one to two percent.

The following economic information is from the Census Bureau's *1993 Motor Freight Transportation and Warehousing Survey Report*. As with the census data conveyed in Exhibit 7, this survey excludes private motor carriers that operate as auxiliary establishments to non-transportation companies, as well as independent owner-operators with no paid employees. As a result, the dollar volume estimates and estimates of year-to-year percentage change presented in this report should not be interpreted as representing measurements of total trucking industry activity.

Revenue in 1993 for the for-hire trucking and courier services industry (excluding air courier services) was estimated at $135.9 billion, up six percent from 1992. Long-distance trucking, which accounted for approximately 75 percent of all motor carrier revenue, was up 5.6 percent over 1992. Local trucking revenue rose 9.6 percent from 1992 to approximately $31.6 billion in 1993. Truckload shipments accounted for approximately 61 percent of motor carrier revenue in 1993 and increased 6.8 percent from 1992.

Nearly 48 percent of motor carrier revenue comes from transporting manufactured products, such as furniture, hardware, glass products, textiles and apparel, and the delivery of small packages. Revenue in 1993 from the transport of metal products rose 8.8 percent from 1992. Expenses totaled $127.9 billion in 1993, up 5.8 percent from 1992. Revenue for the courier services industry, excluding air courier services (SIC 4215), rose 7.7 percent in 1992 to approximately $20.2 billion in 1993. The Truck Inventory and Use Summary (TIUS), part of the Census Bureau's Census of Transportation, provides data on the physical and operational characteristics of the U.S. truck population. According to TIUS, an increasing proportion of trucks are being used mainly for "personal transportation," i.e., commuting to work, outdoor recreation, etc. In 1992, almost 70 percent of all trucks were identified as being for personal use; in 1987 the proportion was 66 percent, and in 1982 only 57 percent.

Annual payroll accounted for approximately 33 percent of all trucking expenses, totaling $41.5 million for 1993. Purchased transportation rose 7.6 percent from 1992, while the cost of fuels and maintenance and repair expenses rose 6.7 percent and 7.0 percent, respectively.

Public Warehouse Services

Total operating revenue for public warehousing services increased 8.6 percent from 1992 to $8.1 billion. Total operating expenses rose 8.4 percent from

1992 to $6.8 billion. Employer contributions to employee benefit plans were up to 7.2 percent and represented almost eight percent of the warehousing industry's total operating expenses.

Over 50 percent of all revenue was from general warehousing and storage (SIC 4225). Revenue from refrigerated warehousing and storage (SIC 4222) increased 3.3 percent to $1.7 billion, and accounted for 21 percent of the warehousing industry's total operating revenue in 1993.

Revenue in 1993 for farm product warehousing and storage (SIC 4221), which represents approximately eight percent of the warehousing industry's total operating revenue, increased 9.2 percent to $686 million from 1992, while expenses for the industry were up 7.8 percent to $593 million over the same period.

IV.B. Operations in the Trucking Industry

This section provides an overview of commonly-employed processes within the trucking industry, broken down by operations. This discussion is not exhaustive; the operations discussed here are intended to represent the major sources of environmental hazards from trucking operations. The operations discussed include materials transport, truck maintenance, truck washing, tank truck cleaning, and transport operations.

IV.B.1. Truck Terminals and Maintenance Facilities

Many segments of the trucking industry operate their own truck terminals and maintenance facilities. Truck terminals are places where trucks come to consolidate and transfer loads of shipped goods. Terminals typically have large parking and staging areas for tractors and trailers, and a loading dock, from which freight is moved between trailers. Truck maintenance facilities, which may be located on the same property as the maintenance facilities, which may be located on the same property as the terminals, perform routine vehicle maintenance activities which are similar to those performed in the automotive service industry. These activities include replacement of fluids (e.g., motor oil, radiator coolant, transmission fluid, brake fluid), replacement of non-repairable equipment (e.g., brake shoes/pads, shocks, batteries, belts, mufflers, electrical components, water pumps),and repair of fixable equipment (e.g., brake calipers/rotors/drums, alternators, fuel pumps, carburetors). Some maintenance terminals also have fueling facilities, repair vehicle bodies, wash trucks, and perform painting operations.

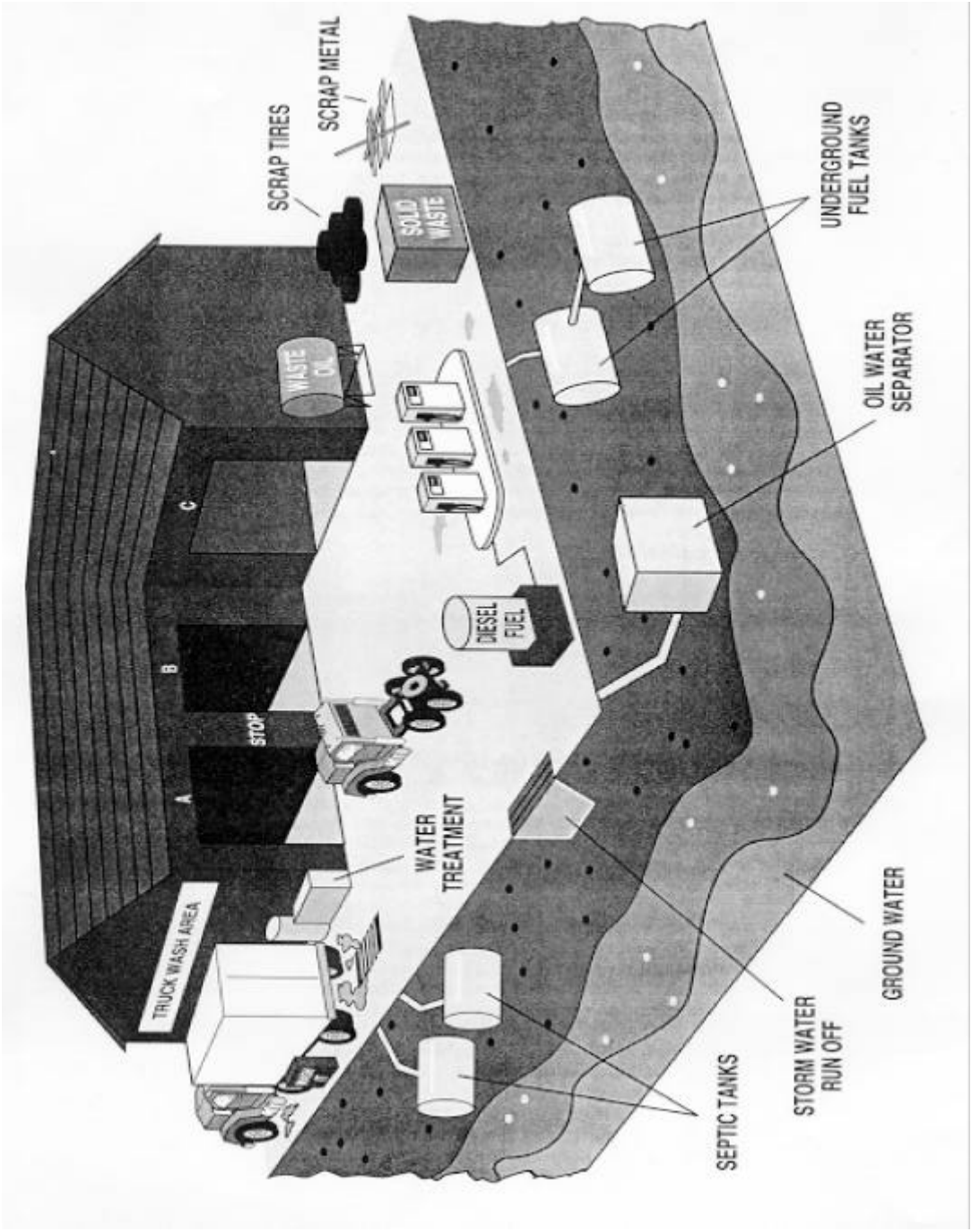
Truck maintenance involves the regular changing of a number of fluids. Automotive fluids used to maintain trucks include brake fluid, transmission fluid, gear oil, radiator fluid, and motor oil. Truck parts removed for repair often require cleaning to allow for better visual inspection of the parts and to

remove contaminated lubricants/greases that would lead to early failure of the repaired part. Rags are often used to clean up a fluid spill or to wipe grease from a part being repaired. If necessary, clean lubricants/greases are applied to the parts during reassembly.

Parts cleaning often involves the use of a parts washer. Washers used in the trucking industry include solvent parts washers, hot tanks, and jet spray washers. A solvent parts washer recirculates solvent continuously from the solvent drum to the solvent wash tray where the parts are cleaned. Old solvent is typically replaced with fresh solvent on a monthly basis. The solvents used for parts cleaning contain petroleum-based ingredients or mineral spirits. Carburetor cleaner contains methylene chloride. Electrically heated tanks are also used to clean parts. Parts are placed in a tank of hot aqueous detergent or caustic solution to achieve cleaning and air or mechanical agitation is employed to increase cleaning efficiency. Jet spray washers also use hot aqueous solutions for cleaning, but in this application, rotating jets spray the parts with cleaner. Both hot tanks and jet sprays are usually serviced monthly by removing the spent cleaner and sludge and recharging the washer with fresh detergent. Sludge that accumulates in the waste sump of the pressure spray cleaning bays and in area wash-down clarifiers is often taken off site to a local municipal landfill.

Truck maintenance facilities may also perform fueling operations. Fueling facilities typically dispense diesel fuel. Exhibit 10 shows the layout of a typical truck maintenance facility.

Exhibit 10
Typical Trucking Maintenance Facility



Source: Stormwater Pollution Prevention Manual for the Trucking Industry ATA, 1993

IV.B.2. Truck Washing

Trucks can be washed manually or by using a fixed wash bay system. Dry washing, by using dry rags and a spray bottle, can be an option for manual truck washing. Manual washing includes hand-held wash systems, hand-held wand systems, and hand brushing with soap. Fixed bay washing operations involve fixed equipment, such as drive-through wash racks or gantry wash systems. Typically, wash bay systems include chemical storage facilities, chemical and water application arches, water reclamation systems, and waste water treatment systems.

IV.B.3. Tank Truck Cleaning

Tank trucks typically haul a wide range of liquid and dry bulk commodities, including food-grade products such as milk and corn syrup, and industrial process chemicals. Many aspects of transportation and labeling, as well as spills and releases of these materials, are regulated by the Research Special Programs Administration (RSPA) of the DOT. Because the material being transported is loaded directly into a tank truck without any sort of container, these trucks require special cleaning to remove residual cargo. Washing, rinsing, and drying methods vary depending on the facility's equipment, the last cargo carried, and the next cargo to be carried. Some cargoes may require only a water rinse, while others may need a series of wash and rinse cycles using different wash solutions.

Prior to tank cleaning, residual cargo, or heel, is removed. Heel volume from tank trucks is typically five to ten gallons (EPA Office of Water and *Preliminary Data Summary for the Transportation Equipment Cleaning Industry*, U.S. EPA, 1989, and EPA Office of Water, Engineering Analysis Division, 1995). Heel can be sent to an off-site Treatment Storage and Disposal Facility (TSDF) or can be treated on site if it is an aqueous solution. If organic, it may be put into containers for later treatment as a hazardous waste.

Tank truck washing is performed either manually with hand-held sprayers, or automatically with high pressure spinner nozzles or "butterworths." With automatic washing, high pressure spinner nozzles are inserted through the main tank hatch, and wash solution and rinse water is automatically sprayed onto the tank surface at 100-600 p.s.i. while rotating around vertical and horizontal axes.

Washing solution may consist of detergent solution, caustic solution, organic solvents, or steam. Any wash solution can be used with either the manual or automatic washing method, although worker safety is a concern when manually spraying solvent and caustic wash solutions. Some facilities have the capability to recycle washing solutions within a closed system, and

periodically change to fresh water solutions. Tanks can be rinsed with hot or cold water, and dried with passive or forced air.

IV.B.4. Transport Operations

Transport operations refer to all operations performed by a truck while on the road. These operations include loading and unloading cargo, running the truck engine, and fuel consumption. Commercial trucking transportation operations consumed approximately 36 billion gallons of oil in 1993, or about 63 percent of total U.S. consumption. This figure, according to the ATA, includes 23 billion gallons of diesel fuel and 13 billion gallons of gasoline.

IV.C. Raw Material Inputs and Pollution Outputs

IV.C.1. Truck Terminals and Maintenance

Materials Spills and Releases

In truck terminals, spills and releases of hazardous material shipments are the main environmental issue of concern. Hazardous waste transportation is a highly regulated and specialized segment of the trucking industry, covered by extensive EPA (40 CFR) and DOT (49 CFR) regulations while the waste is in transit. Due to the additional insurance and safety requirements, the majority of general freight trucking companies do not have the authority nor desire to transport hazardous waste.

Truck Maintenance

Maintenance facilities handle vehicle fluids that are used during normal trucking operations, including oil, transmission fluid, brake fluid, and antifreeze. The quantities of waste materials vary depending on the size of the facility and the types of maintenance activities that are performed.

Oil, transmission fluid, and other liquids that are replaced, must be collected and stored for later disposal. The storage, disposal, and transportation of used oil is regulated by EPA and is a primary environmental concern in the trucking industry. Generators of used oil must meet on-site management standards for storage prior to shipment off-site or burning on-site for energy recovery. Storage containers must be in good condition without leaks and clearly labeled with the words "USED OIL." If a release occurs (spill or leak), the generator must stop and contain the release, clean up and properly manage the released used oil, and repair or replace any leaking containers.

Fluids such as antifreeze must be evaluated for hazardous waste

characteristics and dealt with accordingly if spilled or released. Antifreeze consists of water and ethylene glycol. Neither of these ingredients demonstrates hazardous waste characteristics, however, as a result of use, the antifreeze may become hazardous based on metals or benzene content.

Sludge that accumulates in the maintenance facility floor drains can contain oil, grease, solvents, and dirt from routine operations. The hazardous/non-hazardous nature of the sludge will determine the applicable disposal regulations.

Truck Repair

Repair activities typically produce several types of waste materials in addition to the parts themselves (i.e., batteries, brake parts, etc.), including oil, coolants, and solvents. Oil rags can be considered a "used oil" waste. Shop rags which are used to wipe up a hazardous waste (i.e., paint thinner) may be a hazardous waste.

Spent lead-acid batteries are exempt from regulation as a hazardous waste provided they are recycled. Generators of spent lead-acid batteries may store and/or transport those batteries without waste activity notifications or permits as long as the batteries are ultimately reclaimed. In some States, a new battery cannot be purchased without the return of a used battery.

Used tires are a significant waste produced at truck maintenance facilities. Old tires are not acceptable for landfill disposal unless they have been shredded or quartered. Tires can be returned to a central location for processing or recycling. Used truck tires are usually retreaded or recycled. Used tires otherwise ready to be scrapped might be categorized as hazardous waste.

Parts Washing

Parts washing solvents and residual liquids such as petroleum distillates, mineral spirits, and naphtha are all considered hazardous wastes due to ignitability. Filters removed from parts whose units may also be hazardous due to toxicity (presence of metals and/or benzene) and ignitability. Even filters which are not hazardous may still not be acceptable for landfill disposal due to hydrocarbon content.

Air emissions occur when the solvent is sprayed onto parts and when parts are improperly drained of solvent. Many air quality control districts specify that equipment cannot be designed so as to provide a fine spray mist (which leads to high evaporation rates) and that parts must be properly drained before removal from the washer. For washers in which the solvent bath is always exposed to the atmosphere (i.e., wash tanks), the lid must be kept closed

whenever the tank is not in use.

Fueling Operations

Fueling operations may result in fuel spills or releases. Waste diesel fuel may be a hazardous waste because its flash point ranges from 120°F to 160°F and because it may contain concentrations of heavy metals and benzene in excess of regulatory limits. Diesel fuel spills and releases – both underground and above ground – are a significant concern in the trucking industry in terms of stormwater run-off and land contamination.

IV.C.2. Truck Washing

The waste streams generated by vehicle washing operations are variable. If vehicles are washed often, they enter the washing operation relatively clean, and the waste wash water generated is cleaner thana waste stream generated from washing vehicles that are washed only occasionally. The technology used to wash the vehicle will also affect the waste stream. For example, if a two-step acid-detergent wash is used, acid or salts will be found in the waste stream that would not be present if the vehicle was steam cleaned. Season and location can also affect the waste stream generated, for example, vehicles in the northeast often bring in heavy mud and road salt in the winter months.

Vehicle washing is a regulated maintenance activity under the NPDES program. Wastewater from vehicle washing and floor drain discharge is considered industrial waste. The hazardous or nonhazardous nature of the wastewater determines the applicable disposal regulations.

IV.C.3. Tank Cleaning

The primary pollutant output from tank cleaning operations is wastewater contaminated with tank residues and cleaning solutions. Specific outputs include: spent cleaning fluids, fugitive volatile organic compound (VOC) emissions, water treatment system sludges, and tank residues. The quantities of these outputs vary widely from facility to facility depending on the type of cargo and cleaning methods. For example, an independent owner/operator tank truck cleaning facility serving a large number of different users will generate wastewater containing many ore contaminants than a shipper operated facility serving trucks all carrying the same cargo.

Tank heels from a shipment of hazardous waste greater than 0.3 percent of weight of the tank capacity continue to be regulated by RCRA after the discharge of the waste at a TSDF. Under current regulation, the use of solvents to further rinse out tanks is not considered treatment; however, certain State RCRA programs regulate these processes more stringently and should be contacted to determine if a treatment permit is required.

IV.C.4. Transport Operations

Transport operations have the potential to generate three types of waste: the release or spill of a hazardous waste during loading and unloading operations; the spill or release of vehicle fluids such as oil or antifreeze during travel; and, most significant, the emissions generated during fuel combustion. As discussed above, engines, especially those of heavy duty trucks, generate several forms of air pollution. Among common substances released to the air from truck engines are hydrocarbons, carbon monoxide, oxides of nitrogen, sulfur compounds, and particulate matter. A description of each of these pollutants follows, while more information about EPA regulations governing emissions is provided in Section VII.

Hydrocarbons: Although hydrocarbon emissions are not problematic when they leave the vehicle, some hydrocarbons react in the atmosphere to promote the formation of photochemical smog. Ozone concentration is generally used to measure the extent of this photochemical reaction. Hydrocarbon emission standards have been set to meet the National Ambient Air Quality Standard (NAAQS) for ozone.

Exhibit 11
Hydrocarbons Emission Sources

Hydrocarbons Emissions Source	Percentage of Total Emissions
Stationary Fuel Combustion	3.1%
Industrial Processes	13.3%
Passenger Cars - Gasoline Engine	17.8%
Light-Duty Trucks - Gasoline Engine	6.4%
Heavy-Duty Vehicles - Gasoline Engine	0.8%
Diesel Engine Vehicles	1.8%
Other	56.8%

Source: ATA

Carbon Monoxide: Carbon monoxide (CO) is a byproduct of incomplete fuel combustion. The chemical is a colorless, tasteless, odorless gas that displaces oxygen in the body. At high concentration in confined areas, CO can be injurious to health. EPA has set a NAAQS and a vehicle emission standard for CO.

Exhibit 12
Carbon Monoxide Emission Sources

Carbon Monoxide Emissions Source	Percentage of Total Emissions
Stationary Fuel Combustion	7.1%
Industrial Processes	5.7%
Passenger Cars - Gasoline Engine	44.0%
Light-Duty Trucks - Gasoline Engine	14.5%
Heavy-Duty Vehicles - Gasoline Engine	2.9%
Diesel Engine Vehicles	1.9%
Other	23.8%

Source: ATA

Nitrogen Oxides: Emissions of nitrogen oxides (NO_X) are a significant contributor to the creation of nitrogen dioxide, and are ingredients in the formation of smog, although they play an ambiguous role in the process; at times No_x appear to promote smog, while at other times they seem to inhibit smog in urban areas.

Exhibit 13
Nitrogen Oxides Emission Sources

Nitrogen Oxides Emissions Source	Percentage of Total Emissions
Stationary Fuel Combustion	50.6%
Industrial Processes	3.8%
Passenger Cars - Gasoline Engine	15.2%
Light-Duty Trucks - Gasoline Engine	4.9%
Heavy-Duty Vehicles - Gasoline Engine	0.8%
Diesel Engine Vehicles	11.4%
Other	13.2%

Source: ATA

Sulfur Compounds: Sulfur compounds are oxides that aggravate the respiratory system and may cause respiratory disease. Very dense smog is generally attributed to the buildup of SO and particulates during periods of little air movement. Motor vehicles of all types, including passenger cars, contribute only 4.2 percent of ambient sulfur compounds.

Particulates: Particulates are particles of solid material that are products of incomplete combustion, such as soot and fly ash. Small particles may remain suspended in the air for long periods of time, while larger particles return to the ground as dust. Suspended particles cause reduced visibility and increased health hazards from other contaminants by providing a surface to carry chemicals into human lungs.

Exhibit 14 summarizes the pollution outputs from those operations in the trucking industry discussed in this document.

Exhibit 14
Process Material Input/Pollutant Output from Trucking Operations

Activity	Material Input	Air Emissions	Process Wastes
Truck Terminals and Maintenance Facilities	Motor oil, brake fluid, transmission fluid, coolants, solvents, parts cleaning solutions, lubricants, truck cargo	Possible CFC and VOC emissions	Used oil, used automotive fluids, solvents, coolants, used rags, used cleaning solutions, spilled or released truck cargo
Vehicle Exterior Washing	Detergent, caustic solution, organic solvents, steam	VOC emissions	Oil and grease, suspended solids, detergents, pH, metals
Tank Cleaning	Residuals from shipments, cleaning fluids – detergent, caustic solution, organic solvents, steam	VOC emissions	Spent cleaning fluids, water treatment system sludges, tank residues
Transport Operations	Gas and diesel fuels, alternative fuels, motor oil, brake fluid, transmission fluid, coolant, truck cargo	Hydrocarbons, carbon monoxide, oxides of nitrogen, sulfur compounds, particulates	Used oil, used automotive fluids, spilled or released truck cargo

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